

INCH-POUND

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SUPERSEDING
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PERFORMANCE SPECIFICATION SHEET
ELECTRON TUBE, NEGATIVE GRID (MICROWAVE)
TYPE 7486

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Triode, metal-ceramic.

See figure 1.

Mounting position: Any.

Weight: 0.06 ounce (1.7 grams) nominal.

ABSOLUTE RATINGS:

Parameter:	Ef	Eb	Ec	Ehk	Rk	Rg
Unit:	V	V dc	V dc	v	ohms	Meg Ω
Maximum:	6.6	250	0	+50	---	0.01
Minimum:	6.0	---	-50	-50	---	---
Test conditions:	6.3	150	0	---	82	---

ABSOLUTE RATINGS:

Parameter:	ik	Ik	Ic	Pp	TE	Barometric pressure, reduced
Unit:	ma	mA dc	mA dc	W	°C	mm Hg
Maximum:	40	11	2.2	1.0	250 <u>1</u> /	8
Minimum:	---	---	---	---	---	---
Test conditions:	---	---	---	---	---	---

See footnotes at end of table I.

GENERAL:

Qualification - Required.

TABLE I. Testing and inspection.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level <u>13/</u>	Symbol	Limits		Unit
						Min	Max	
<u>Qualification inspection</u>								
Barometric pressure, reduced	1002	<u>4/</u>	Voltage = 300 V ac	---	---	---	---	---
Sweep-frequency vibration	1031	<u>10/</u>	Ebb = 150 V dc; Rp = 10,000 ohms; 10 G; F= 100 to 2,000 Hz	---	Ep	---	15	mV ac
Sweep-frequency vibration fatigue	1031	<u>11/</u>	Eb = Ec = 0; Ef = 6.3 V	---	---	---	---	---
Sweep-frequency vibration fatigue test end points:	---							
Low-frequency vibration	1031	---		---	Ep	---	15	mV ac
Heater-cathode leakage	1336	---		---	lhk	---	30	μ Adc
Transconductance (1)	1306	---		---	Sm	6,500	---	μ mhos
Heater current	1301	---		---	If	222	258	mA
<u>Conformance inspection, part 1</u>								
Heater current	1301	---		0.65	If	222	258	mA
Heater-cathode leakage	1336	---		0.65	lhk	---	20	μ A dc
Electrode current (anode)	1256	---		0.65	lb	4.5	11.0	mA dc
Transconductance (1)	1306	---	Eb = 100 V dc; Rk = 0	0.65	Sm	8,000	---	μ mhos
Pulsing emission	1231	<u>2/</u>	Rk = 1.0 ohm	0.65	ik	90	---	ma
Short and discontinuity detection	1201	---		0.65	---	---	---	---
<u>Conformance inspection, part 2</u>								
insulation of electrodes	1211	---		---	R	100	---	Meg Ω
Transconductance (2)	1306	---	Ef = 6.0 V; Eb = 100 V dc; Rk = 0	---	Δ Sm Ef	---	20	%
Electrode voltage (grid)	1261	---	Rk = 0; Ec/lb = 100 μ A dc	---	Ec	---	-4.5	V dc
Amplification factor	1316	---		---	Mu	65	115	---

See footnotes at end of table.

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TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 13/	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 2</u> - Continued.								
Grid emission	1266	<u>3/</u>	Ef = 7 V; Ecc = -20 V dc; Rg = 0.1 MegΩ	---	Ic	0	-2.0	μA dc
Grid recovery	2210	<u>7/</u>	Ebb = 250 V dc; Ec/lb = 3.0 mA dc; Rp = 0.01 MegΩ	---	ΔIb ΔIb	--- ---	0.6 1.0	mA dc ma
Direct-interelectrode capacitance	1331	---		---	Cgp Cin Cout Chk	1.06 1.20 0.005 0.80	1.36 2.10 0.015 1.40	pF pF pF pF
Envelop strain	---	<u>5/</u>		---	---	---	---	---
Low-frequency vibration	1031	<u>9/</u>	Ebb = 150 V dc; Rp = 10,000 ohms; 15 G; F = 40 Hz	---	Ep	---	10	mV ac
<u>Conformance inspection, part 3</u>								
Heater-cycling life	1506	<u>8/</u>	Ef = 7 V; Ehk = +70 V; Rk = 0; Ec = Eb = 0	---	---	---	---	---
Heater-cycling life-test end points:	---							
Heater-cathode leakage	1336	---		---	Ihk	---	40	μA dc
Stability life	1516	<u>6/</u>	Ebb = 150 V dc; Rk = 0; Eg = 7.7 V ac; Ehk = -70 V dc; Rg = 3,300 ohms; Rb = 4,700 ohms; TA = 20°C	2.5	---	---	---	---
Stability life-test end-point: (2 and 20 hours)	---							
Change in transconductance (1) of individual tubes	---	---		---	ΔSm t	---	15	%

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Notes	Conditions	Acceptance Level 13/	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 3</u> - Continued.								
Intermittent life	1501	---	Group A					
Operation (1)	---	---	Stability life-test conditions; t = 1,000 hours	---	---	---	---	---
Operation (2)	---	---	Ebb = 150 V dc; Ec = -10 V dc; ec = +8 v (driver side of Rg); Rg/g = 50 ohms; Rb = 60 ohms; tp = 10 ± 1 μs; Du = 0.01 ± 0.1 %; Ehk = -70 V dc; t = 1,000 hours	---	---	---	---	---
Intermittent life-test end points:								
Operation (1)	---	---						
Heater current	1301	---		---	If	222	264	mA
Transconductance (1)	1306	---		---	Sm	6,500	---	μmhos
Transconductance (2)	1306	---		---	ΔSm	---	25	%
Heater-cathode leakage	1336	---		---	Ef lhk	---	20	μA dc
Operation (2)	---	---						
Heater current	1301	---		---	If	222	264	mA
Pulsing emission	1231	---		---	ik	60	---	ma
Heater-cathode leakage	1336	---		---	lhk	---	20	μA dc
Shock	1041	12/	Hammer angle = 30° Ehk = 50 V dc	---	---	---	---	---
Shock-test end points:								
Low-frequency vibration	1031	---		---	Ep	---	15	mV ac
Heater-cathode leakage	1336	---		---	lhk	---	30	μA dc
Transconductance (1)	1306	---		---	Sm	6,500	---	μmhos
Heater current	1301	---		---	If	222	258	mA

1/ Operation below the rated maximum temperature is recommended for applications requiring the longest possible tube life.

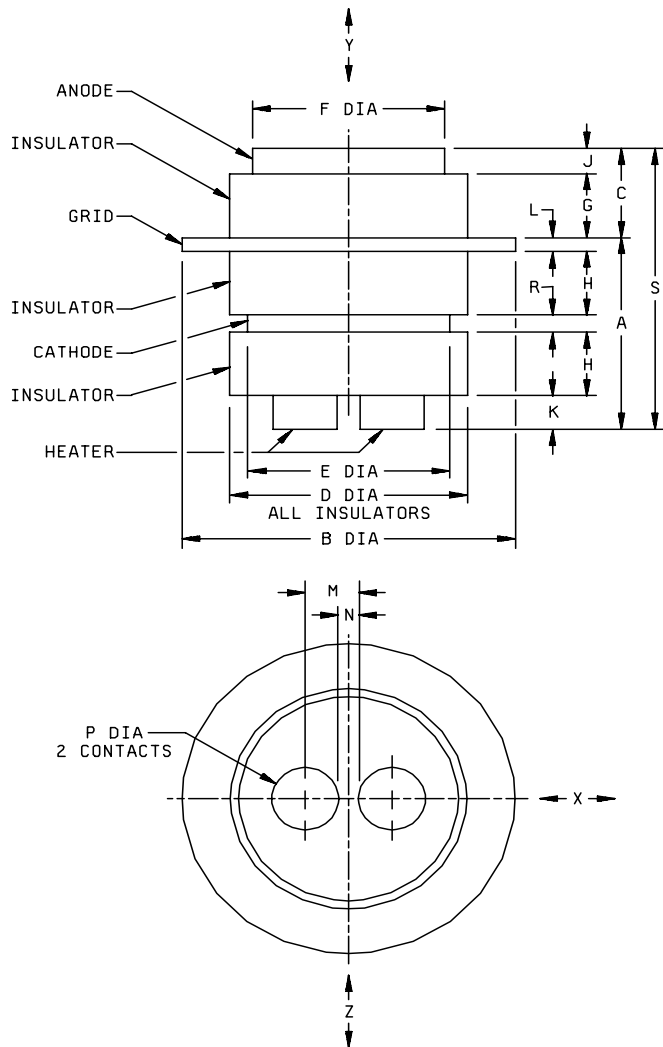
2/ Ec = -10 V dc. Grid is driven with the pulse circuit as follows: ec = +7 V; prr = 1,000; tp = 10 ± 1 μs; tr = 1 μs (max); tf = 1 μs maximum. Read peak cathode current.

TABLE I. Testing and inspection - Continued.

- 3/ Prior to this test, tubes shall be preheated a minimum of 5 minutes at the conditions indicated below. The 3-minute test is not permitted. Test within 3 seconds after preheating. Grid emission shall be the last test performed on the sample selected for the grid-emission test.

Ef	Ecc	Eb	Rk	Rg
V	V dc	V dc	Ohms	Meg
7	0	150	82	0.1

- 4/ The tube shall be tested as specified in MIL-STD-1311 method 1002 with the exception that the specified voltage shall be applied between the anode and grid.
- 5/ Tubes shall be tested as specified in MIL-STD-1311 method 2126, except that they shall be first immersed in water at not more than 5°C for 15 seconds and immediately thereafter subjected to the standard temperature cycle specified in MIL-STD-1311 method 2126. Tubes having high heater current of 300 mA or more shall be rejected as evidence of air leaks.
- 6/ $E_g = 7.7$ V ac, 60 Hz, applied to grid through 100 μ F coupling capacitor. Grid is connected to ground through 3,300 ohms.
- 7/ Grid recovery. Test shall be performed as follows:
- With tube under test (TUT) operating under specified conditions, adjust E_c for $I_b = 3$ mA dc.
 - Apply 5 volt pulse, 20 μ s duration, 60 pps to the grid.
 - With application of pulse, measure undershoot (ΔI_b) and change in average current (ΔI_b).
- 8/ The heater-cycling life-test sample shall consist of 15 tubes and no tube failure shall be permitted. In the event of rejection of the first sample due to failure of 1 tube, a second sample of 15 tubes shall be selected from the lot. Acceptance shall then be based on the combined first and second samples. The total tube failures from the combined first and second samples shall not exceed one.
- 9/ Low-frequency vibration. Test shall be performed as follows: The tube shall be vibrated with simple harmonic motion in each of two planes; first, parallel to the cylindrical axis; second, perpendicular to the cylindrical axis and parallel to a line through the heater contacts.
- 10/ Sweep-frequency vibration. Test shall be performed as follows:
- The frequency shall be increased from 100 to 2,000 Hz with approximately logarithmic progression in 3 ± 1 minutes. The return sweep (2,000 to 100 Hz) is not required.
 - The tube shall be vibrated with simple harmonic motion in each of two planes; first, parallel to the cylindrical axis; second, perpendicular to the cylindrical axis and perpendicular to a line through the heater contacts. At all frequencies from 100 to 2,000 Hz, the total harmonic distortion of the acceleration waveform shall be less than 5 percent.
 - The peak acceleration shall be maintained at 10 ± 1.0 G throughout the test.
 - The value of the alternating voltage, E_p , produced across the resistor, R_p , as a result of the vibration shall be measured with a suitable device having response to the RMS value of the voltage to within ± 0.5 dB of the response at 400 Hz for the frequency range of 100 to 3,000 Hz, and having a bandpass filter with an attenuation rate of 24 dB per octave below the low-frequency cut-off point of 50 Hz and above the high-frequency cut-off point of 5,000 Hz. The meter shall have a dynamic response characteristic equivalent to or faster than a VU meter (operated in accordance with Standard ASA No. C 16.5-1954).
- 11/ Sweep-frequency vibration fatigue. Test shall be performed as specified in method 1031, except that the tubes shall be vibrated for a total of 6 hours, that is, 3 hours in each of two directions; first, parallel to the cylindrical axis; second, perpendicular to the cylindrical axis and parallel to a line through the heater contacts.
- 12/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2 with an acceptance level of 6.5 (see 13/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.
- 13/ This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	.268	.292	6.81	7.42
B	.476	.484	12.09	12.29
C	.156	.174	3.96	4.42
D	---	.335	---	8.51
E	.281	.289	7.14	7.34
F	.271	.279	6.88	7.09
G	.095	.105	2.41	2.67
H	.095	.105	2.41	2.67
J	.034	.046	0.86	1.17
K	.047	.063	1.19	1.60
L	.024	.030	0.61	0.76
M	.055	.081	1.40	2.06
N	.030	---	0.76	---
P	.086	.094	2.18	2.39
R	.022	.028	0.56	0.71
S	.430	.460	10.92	11.68

NOTES:

1. Eccentricity of anode, grid, and cathode with respect to centerline shall be .005 inch (0.13 mm) maximum.
2. Eccentricity of insulators with respect to centerline shall be .010 (0.25 mm) maximum.
3. Centerline of grid shall be reference line for horizontal tolerances.
4. Bottom surface of grid shall be reference plane for vertical tolerances.

FIGURE 1. Outline drawing of electron tube type 7486.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet references MIL-STD-1311.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

Custodians:

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Navy - EC
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Preparing activity:

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Review activities:

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